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Report of the second session of the

IPFC/IOFC AD HOC WORKING PARTY OF SCIENTISTS ON STOCK ASSESSMENT OF TUNA

Nantes, France, 16-18 September 1974

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
ROME, 1974

REPORT

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PREPARATION OF THIS REPORT

This is the final version of the report prepared by the Working Party.

Distribution

Participants
Members of the Indo-Pacific Fisheries Council
Members of the Indian Ocean Fishery Commission
Other interested nations and international organizations
FAO Department of Fisheries
Fishery Officers in FAO Regional Offices

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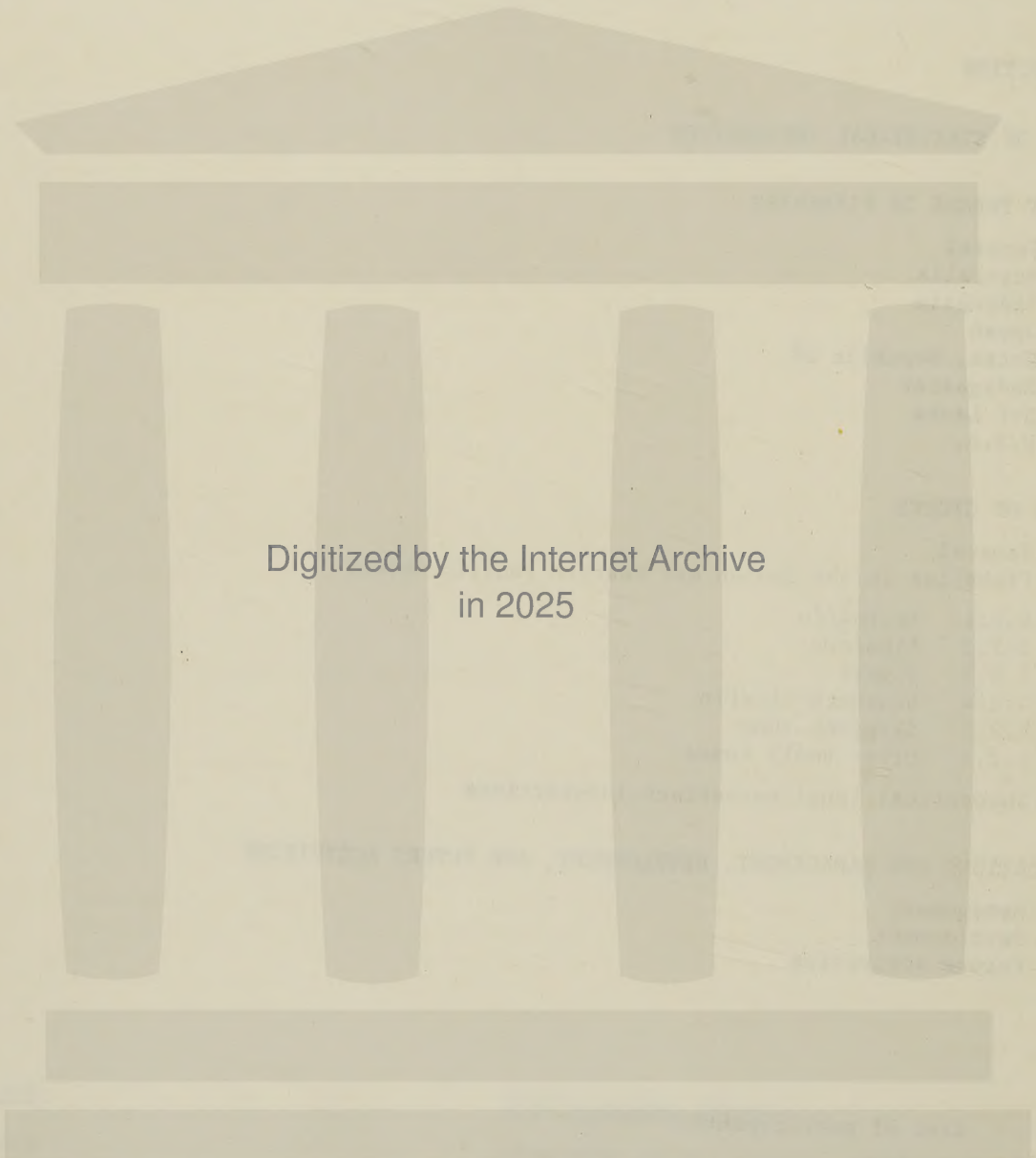

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1 INTRODUCTION

The Working Party met at the Institut Scientifique et Technique des Pêches Maritimes, Nantes, France, 16-18 September 1974. J. Joseph served as Chairman and W.W. Fox served as Rapporteur. A list of the participants is included as Appendix 1.

The Working Party adopted the agenda shown in Appendix 2.

A list of the documents reviewed at the meeting is included as Appendix 3. The Report of the First Session of the IPFC/IOFC Ad Hoc Working Party of Scientists on Stock Assessment of Tuna held in Rome, 1972 (FAO Fish.Rep.,(137):17 p) will be referred to herein as the First Report.

2 REVIEW OF STATISTICAL INFORMATION

Provisional statistics for certain fisheries of the Indian Ocean were given in document 2. Statistics compiled by FAO for the western Pacific and Indian Oceans were presented. Other documents containing significant catch and effort statistics are documents 6, 7, 10, 11 and 13.

The best estimates of catch by species, by gear, by country and year are given in Appendix 4. These statistics represent only working estimates compiled by the Working Party and are not official statistics.

Concern was expressed over accurate reporting by species; for example, black skipjack (Euthynnus spp) is frequently mixed with skipjack (Katsuwonus pelamis), and black marlin (Makaira indica) and blue marlin (Makaira nigricans) are likewise mixed. The Working Party recommended that special attention be given to the separation of data by species.

3 CURRENT TRENDS IN FISHERIES

3.1 General

Scientists from the various countries were asked to briefly review current trends in the tuna fisheries of their countries.

3.2 Australia (Document 10)

The total number of boats participating in the surface fishery for southern bluefin in Australia has fluctuated directly with the apparent abundance of the fish; however, the number of standard boats has remained rather constant on the average. Some of these standard boats shift back and forth between the New South Wales and South Australia southern bluefin tuna fisheries. Catches in recent years have fluctuated between 6 000 and 13 000 metric tons (mt).

3.3 Indonesia

The skipjack fishery in Indonesia has existed for years and the majority of the boats operating are sail-powered. Production exceeds the estimate of 12 000 mt given in the First Report. Much of the catch made by small baitboats is taken off the eastern part of Indonesia, east of the Wallace Line, where there are three main landing ports, Bitung, Ambon and Sorong. There are three new projects under way in which 80 baitboats, of about 30 mt each, are to be built. They are expected to take a total annual catch of about 24 000 mt. Additionally, longline bases in Sumatra (Sabang) and Bali (Benoa) are being established. Nine longliners, each with 100 mt capacity, will operate from each base. At present skipjack is largely for domestic consumption and all other tunas are exported.

3.4 Japan

Most notable in the longline fisheries is the trend to catch largely southern bluefin and bigeye for the Japanese sashimi market. This has resulted in a decrease in albacore and yellowfin catches. The number of hooks has stabilized or decreased since 1963, because of limited licensing. In the western Pacific, the baitboat fishery for skipjack has expanded to about 10°S in recent years; the estimated total catch in 1973 was about 250 000 mt (160-170 000 mt from the Home Islands area and the rest from the southern area). This expansion has permitted the fishery to continue all year. Purse seine fisheries in the western tropical Pacific are still not successful; however, near the Home Islands this year there was an exceptional purse seine catch of 5 000-6 000 mt of yellowfin.

3.5 Korea, Republic of

Since 1964, the Korean longline catch in the Indian Ocean has increased. In 1972, the total Korean catch was 60 000 mt, 35% from the Indian Ocean and 65% from the Pacific Ocean. The catch is mainly for export and consists largely of albacore and yellowfin. Some longliners are based in Pusan for fishing southern bluefin.

3.6 Madagascar (Document 11)

A surface skipjack fishery began in Madagascar with about 3 boats in 1972 and there are now about 10 baitboats operating, making trips of up to 5 days and preserving their catch in ice. Skipjack represents 80-90% of their catch which should reach about 10 000 mt in 1974. Bait around Madagascar is not yet a problem as catches of mostly Sardinella spp., but some Stolephorus spp., of up to 400-600 kg per night are made. Trolling for yellowfin is beginning in the Seychelles Islands. Some purse seining by a French vessel was tried but the results were disappointing due to the high speed and small sizes of the tuna surface schools.

3.7 Sri Lanka (Document 12)

Recent total production of all tuna and tuna-like species is about 22 000 mt. There have been shifts over the years among the basic gear types, such as driftnets, longlines, baitboats and trollers. Bait fishing has been very seasonal; however, recent attempts to catch bait fish other than "red bait" by purse seining has been very successful. The fishery is now concentrating on driftnet fishing, which has produced the best catch rates. Fishing is affected by the seasonal shifts of the monsoons. Recruitment occurs primarily during the southwest monsoon and the extent of the monsoon is directly correlated with the success of the succeeding tuna fishery. Purse seine and baitboat fishing are very difficult during the monsoon seasons because of the lack of surface schools and because bait is difficult to catch by purse seine due to bad weather. The surface catch is mainly skipjack, with small quantities of yellowfin, little tuna and frigate mackerel taken. The longline catch, mostly yellowfin and bigeye, is being made closer and closer to Sri Lanka as the catch rates far away are no better.

3.8 U.S.A.

The Hawaiian tuna fishery, averaging 4-5 000 mt/year, lands mainly skipjack. There have been no significant trends in catch or effort. Bait has been a problem, so there have been some experiments on the transport of anchovy from California for use as bait with some marginal success. There are plans to conduct some experimental purse seine fishing in the central Pacific this year.

4 STATUS OF STOCKS

4.1 General

In the recent past, most of the Indian Ocean tuna catches have been made with longline gear. The surface fisheries, particularly for skipjack and yellowfin, appear to be increasing in importance each year. This trend is likely to raise a number of important questions in the near future as it has in the Atlantic Ocean and for southern bluefin tuna. The status of the stocks was addressed first and then longline-surface fisheries interactions were discussed. There is a need for addressing each species from the whole of its fisheries and additional and up-to-date information is urgently needed for the surface and longline fisheries.

4.2 Fisheries in the Indian and western Pacific Oceans

4,2.1 Yellowfin

4.2.1.1 Indian Ocean

In the First Report, it was recommended that analyses be performed separately for the yellowfin of the eastern and western Indian Ocean as they may be separate stocks. Unfortunately, the separation of data has not been completed as yet.

The longline catch in the Indian Ocean, on the average, remained about the same (1963-1971) even with substantially increased effort (document 6), but subsequently appears to have declined. There have been remarkable fluctuations in catch, substantially larger than in any other ocean. The catch rate has declined to 25% of the original level. It is concluded, therefore, that any increase in effort will not provide any substantial increase in catch (Fig. 1). Unfortunately, the Working Party was unable to evaluate recent trends in effort or catch per unit effort due to the lack of data.

Utilizing Japanese data only and examining the east and west areas separately, the hooking rates for both areas have decreased significantly (6); however, the deviations from the trends are not correlated, which could perhaps reflect some separation of stocks. These results underline the need for examining the total data by eastern and western areas separately.

The Japanese longline catch originally consisted mainly of 3 and 4 year old fish, but recently more 1 and 2 year old fish are being taken (6). The average age at first capture has been decreasing remarkably, which is due partly to the shifting of effort from the central to western parts of the Indian Ocean. Analysis of the size composition of Japanese longline catch data suggests that apparent recruitment has remained constant (6) but there are other factors to be examined in order to draw concrete conclusions about the level of real recruitment.

The surface fishery for yellowfin in the Indian Ocean was discussed. It is believed that there is a significant fishery off Somalia for yellowfin of mostly less than 2 years old (2-3 000 mt) but no concrete data are available. The Sri Lanka surface fishery took about 5 000 mt for the most recent years (1972 and 1973), consisting mostly of fish less than 2 years old. Including Madagascar, mainland India, the Laccadives and Maldives, the total surface catch of yellowfin in the Indian Ocean is in the neighbourhood of 10 000-15 000 mt per year in recent years. The surface catch of yellowfin may have doubled from the 1964-1967 period to present, and may be taking in the neighbourhood of 2 million fish. In contrast, the recruitment to the longline fishery was estimated at 1.9 million fish. This is a contradiction if it is assumed that the fisheries operate on the same stock(s) since no reduction in recruitment to the Japanese longline fishery was apparent. Perhaps the longline CPUE of 2 year old fish has not been properly indexing the abundance of recruitment. It is emphasized that the surface catch is becoming very significant and good data on the actual amount of catch, measures of fishing effort, and size composition by time and area strata is absolutely necessary.

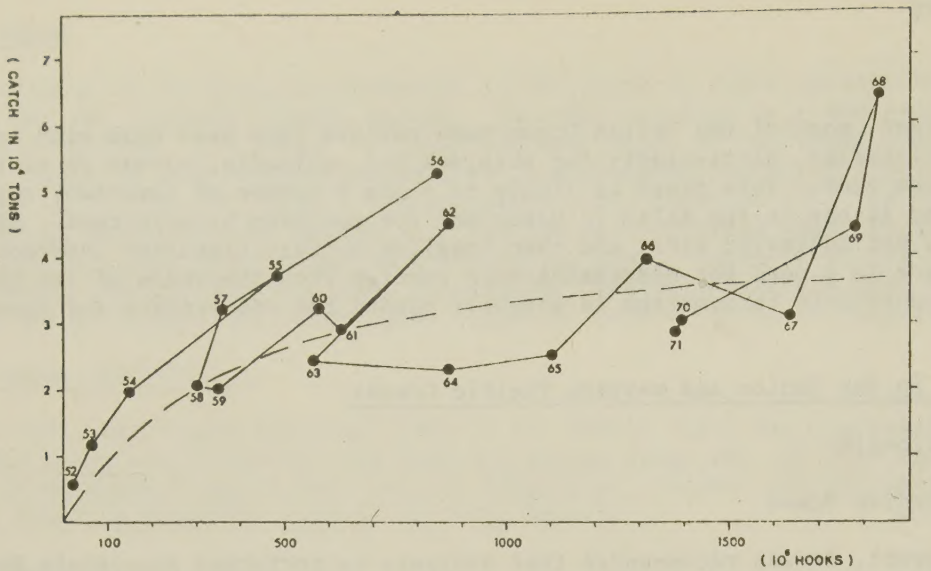

Fig. 1 Yearly amount of catch of yellowfin (in 10^4 mt) plotted against number of standardized hooks from 1952 through 1971 (from Document 6)

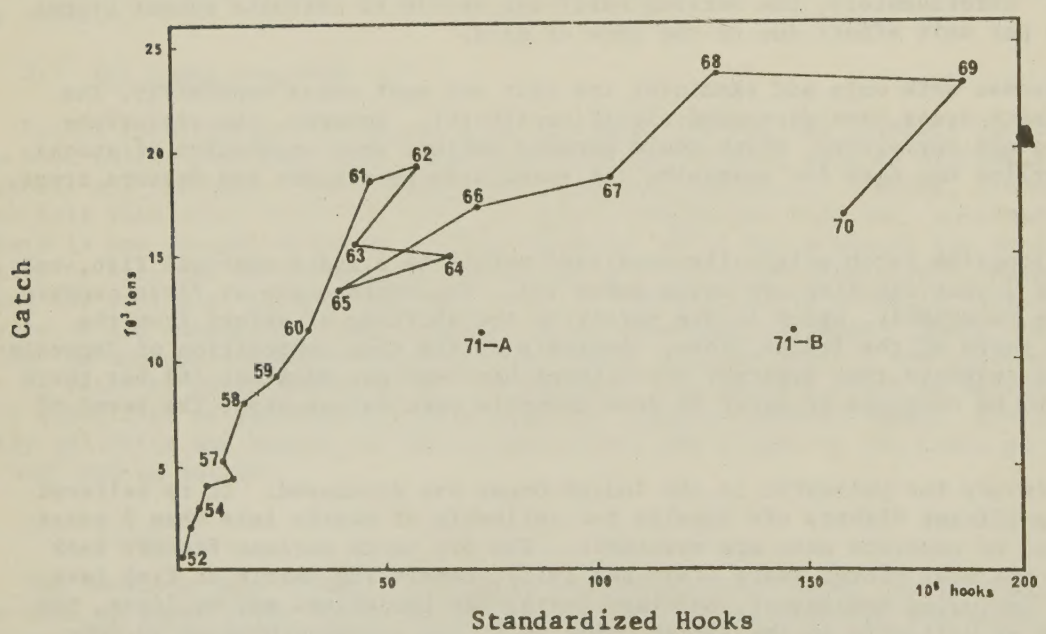

Fig. 2 Annual amount of catch of albacore from the whole Indian Ocean plotted against standardized hooks. For 1971-fishing season, estimate-A and -B are plotted on the basis of Chinese and Japanese catch statistics respectively (from Document 6)

The general conclusion is that the longline catch probably cannot be increased through increased effort, and it may even decrease if the surface fishery further increases. It is noted that experience in the eastern Pacific and eastern Atlantic Oceans has shown that the development of surface fisheries has resulted in much greater catches than expected from analyses of longline data. The Working Party was hampered in its assessment by both the lack of complete recent data (1972-1974) from the longline fisheries and the lack of reasonably accurate surface data.

It was the feeling of some members of the Working Party that both total catch and catch per unit effort in the longline fisheries has substantially decreased in the most recent years. If so, then perhaps there has been overfishing, or the surface fisheries are now having some impact on the longline fisheries.

The Working Party is seriously concerned over trends in the fishery and recommends urgently that IPFC/IOFC focus its attention on the declining catch with respect to considering management measures. The most effective way to corroborate the need for management is to urgently prepare a systematic assessment of the yellowfin fishery in the Indian Ocean, to be completed within 6 months. This would include, but not be limited to, the preparation of tables of catch by year, area, and age, cohort analysis, general production modeling, and re-examination of all previous calculations, taking into account the apparent contradictions.

4.2.1.2 Central and western Pacific

Some general comments were presented. The catch has stabilized and has fluctuated around 60 000 mt. The catch rate has stabilized but at a lower level than formerly, especially in the eastern Pacific, perhaps due to the increased surface fishing activity. A yield per recruit analysis of the central and western Pacific stock(s) would be desirable to determine the potential for developing a surface fishery in this region.

4.2.2 Albacore

4.2.2.1 Indian Ocean

The character of the albacore fishery has continued to change, with Japanese longliners fishing more on the immature albacore south of 30°S while the Chinese and Korean fleets continue to fish the mature group north of 30°S (6). It is noted that the changing character of the albacore fishery has had a considerable effect on the overall catch-effort relationship (Fig. 2). If it were possible to examine recent catch and effort data in time and space for the northern grounds, perhaps other interpretations could be derived.

An analysis was made for data prior to 1968 on just the mature group (Fig. 3). The curve suggests a maximum yield of about 17-18 000 mt for the mature group in the absence of a fishery on the immature group.

Analysis of the immature group fishery shows a significant decline in CPUE 1966-1970 with the greatly increased Japanese effort (6). Calculations indicate that, under present conditions, the expected reduction in recruitment to the mature group fishery is between 11-24%. Depending upon the age at first capture, the maximum yield per recruitment can be between 12-28 000 mt. The optimal ages at first capture are from 3.5 to 5.5 years. The present age at first capture may be 2.5 to 3.2 years, giving a maximum yield per recruitment between 18 000 and 23 000 mt. The expected net result of developing the immature group fishery is some overall increase in the possible total equilibrium yield of Indian Ocean albacore.

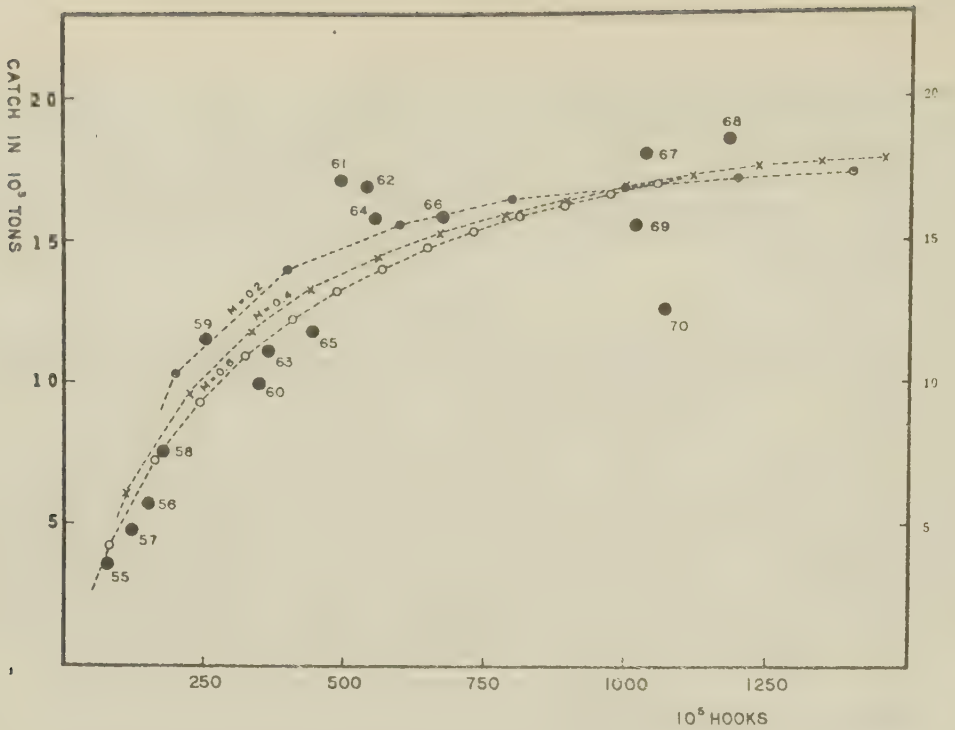

Fig. 3 Yearly number of standardized hooks and resultant catch of albacore (10^3 mt) in the area north of 30°S, 1955-1970, with calculated yield curve under supposed M from 0.2 to 0.6 (from Document 6)

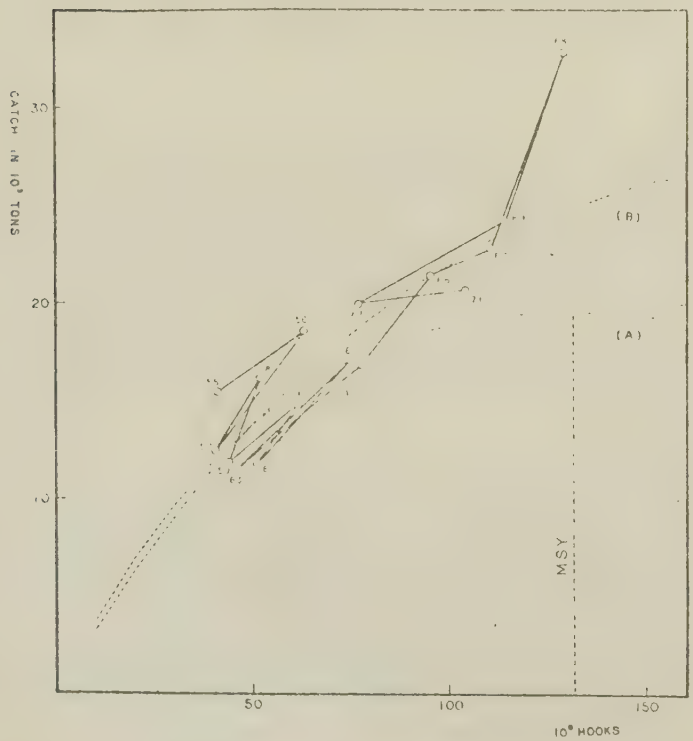

Fig. 4 Observed relationship between number of standardized hooks and resultant amount of catch (10^3 mt) for the bigeye tuna from the overall tuna longline fishing ground of the Indian Ocean, 1955-1971, with calculated yield curve for the fishing ground in the equatorial area (A) and that for the whole Indian Ocean (B) (from Document 6)

It is noted again, as in yellowfin, that the age at first capture has decreased and apparently the catch for 1971 decreased substantially below 1970, following a similar decrease in 1970 below 1969. There is no complete data for the recent years but catches are believed to have been low. Furthermore, a contradiction is noted in that the above analyses indicate a roughly constant or minor increase in yield would be expected from the changing character of the fishery. There may have been a sharp change in catchability in 1970, or 1971 in particular, as evidenced by the change in bait and mode of operation on southern bluefin. On the other hand, there could have been a reduction in actual recruitment.

We have come to the same general conclusion for albacore as for yellowfin: The Working Party is seriously concerned over trends in the fishery and recommends urgently that IPFC/IOFC focus its attention on the declining catch with respect to considering management measures. The most effective way to corroborate the need for management is to urgently prepare a systematic assessment of the albacore fishery in the Indian Ocean, to be completed within 6 months. This would include, but not be limited to, the preparation of tables of catch by year, area, and age, cohort analysis, general production modeling, and re-examination of all previous calculations, taking into account the apparent contradictions. It is particularly urgent to obtain the more recent data from all fleets concerned in order to carry forward the analysis.

4.2.3 Bigeye

4.2.3.1 Indian Ocean

After an apparently large year class went through the fishery in 1968, the catch has fluctuated around 20-22 000 mt through 1971 (6) (Fig. 4).

The percentage of 2 and 3 year old fish in the catch has increased from 1958 to 1971, and the fishery has expanded southward where smaller fish are found on the average. On the basis of recent catch and effort analyses, the equilibrium yield is expected to increase from greater fishing on the immature group (6). As expected, the data for the fishery in recent years are closely following the new relationship (line (B) in Fig. 4). The estimated maximum equilibrium yield from the catch and effort analyses is about 28 000 mt; however, because of the transitional nature of the fishery there is some reservation about this estimate. Yield per recruitment analyses indicate a maximum yield of 27 000-33 000 mt depending upon the parameter estimates (Fig. 5).

In contrast to the observations for albacore and yellowfin, there has not been the very large decline in catch rate in bigeye tuna, and it is apparently not so heavily fished as the other species. Apparently there are still no surface fisheries of significance for bigeye; however, the 1971 catch rate decreased markedly to its lowest observed level, suggesting that data for recent years (1972-1974) in this fishery should be examined soon. It is again concluded, as in the First Report, that a substantial increase in catch, on the average, would not be expected without a very substantial increase in fishing effort.

4.2.4 Southern bluefin

The average fishing mortality coefficient (1972-1974) in the Australian surface fishery for southern bluefin was estimated at $F_a = 0.108$ and the average recruitment of 2½ year old fish at 3.7×10^6 fish through analysis of the catch equation (document 10).

Analysis of tag releases in the surface fishery and subsequent recoveries in both the surface and longline fishery demonstrate a lower than expected recovery of tagged fish in both fisheries, and in particular the longline fishery. This could be explained by a number of factors including (a) an additional type II tagging mortality between age 2+ and 8+ of 1.0, (b) the exploitation rate by longline on the total stock is much lower than calculated,

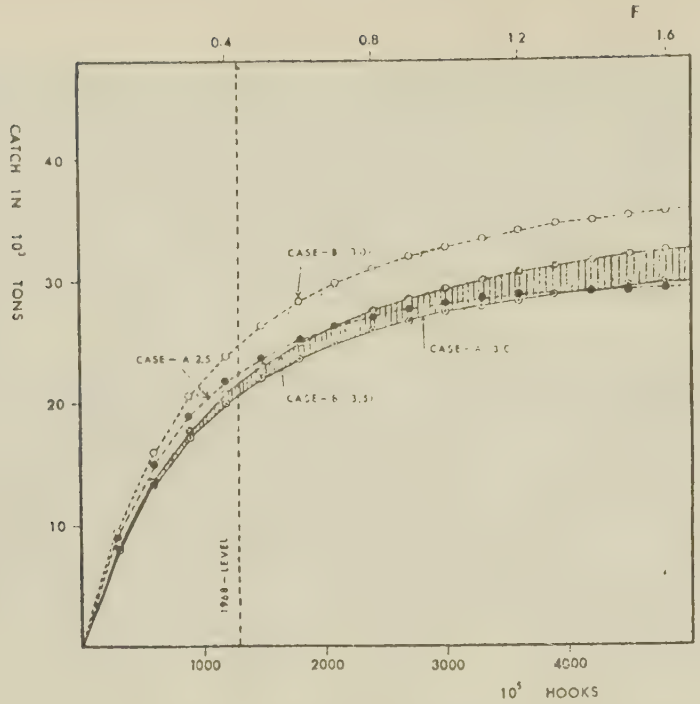

Fig. 5 Calculated yield curve for bigeye tuna in the Indian Ocean

Case-A: age of first capture for the entire ocean - 2.5
age of entry to the area north of 30°S - 3.0
Case-B: age of first capture for the entire ocean - 3.0
age of entry to the area north of 30°S - 3.5
(from Document 6)

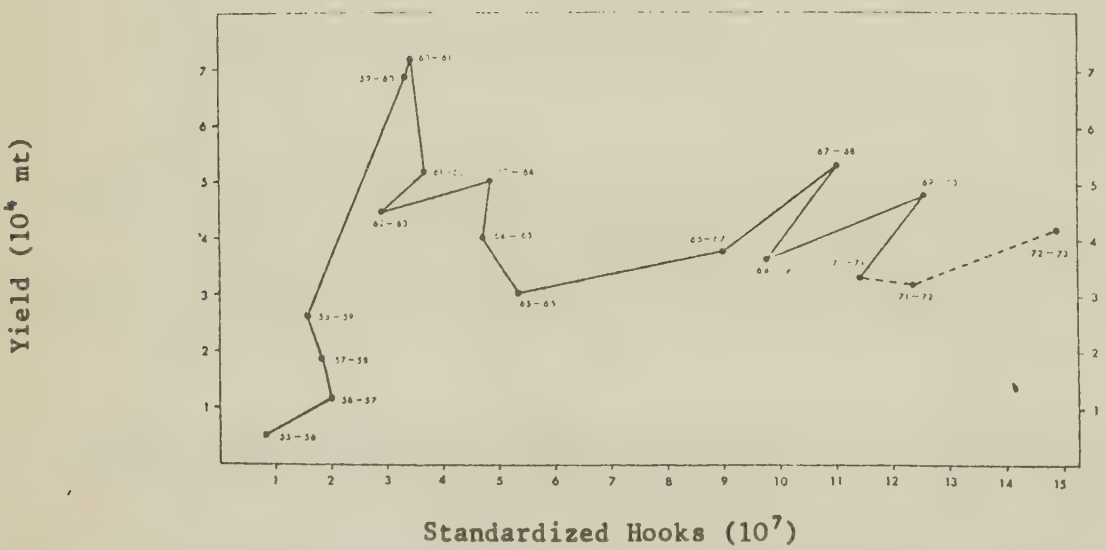

Fig. 6 Observed relation between yield of southern bluefin tuna and amount of standardized effort (10^7 hooks) in the Japanese longline fishery, 1955-1972 fishing seasons (from Document 7)

i.e. the longline fishery operates on only 1/7 of the stock, or (c) there are stocks exploited by the longline fishery in addition to the ones exploited by the surface fishery. The latter case seems a possibility since no tag returns have been made in the northern spawning area where fish of the same age as in the southern area occur, but tags have been recovered in the southern area from fish of the same age as in the northern area. The detailed data from these areas and the years 1963-1970 need careful examination.

Allocations based on calculations of yield per recruitment with several hypotheses about the natural mortality rate, effective fishing mortality rates in the surface and longline fisheries, and possible stock structures were presented (10). The allocation of catch between the two fisheries and the overall yield are sensitive to the hypotheses but not to the value of natural mortality (Table 1).

The general conclusions concerning the longline fisheries analyses are (a) longline effort can be greatly reduced without much decrease in catch (Fig. 6), (b) the spawning stock has been greatly reduced, and (c) there is no apparent reduction in recruitment (Fig. 7, documents 6, 7 and 10).

Table 1

Southern bluefin tuna equilibrium yield allocations (in 1000's mt) for several hypotheses about the relative magnitude of the Australian surface fishery and the Japanese longline fisheries with M = 0.2 (from document 10, Tables 8 and 9)

Japanese longline fishing mortality coefficient (F_e)	Australian fishing mortality coefficient (F_a)	Australian yield[1] (Y_a)	Longline yield[2] (Y_e)	Total yield (Y_t)
0.50	0.00	0	65	65
	0.11	9	50	59
	0.25	18	35	53
0.11	0.00	0	58	58
	0.06	9	50	59
	0.13	18	42	60

1/ Recent mean annual catch is 9 000 mt

2/ Recent mean annual catch is 50 000 mt

Examination of the longline data after implementation of voluntary regulations indicates that there have not yet been any measurable effects of the regulations (document 7); however, the fish in regulatory areas south of 30°S are, on the average, smaller and younger than in the other areas combined, so the effect of the regulations should be largely to increase yield per recruit.

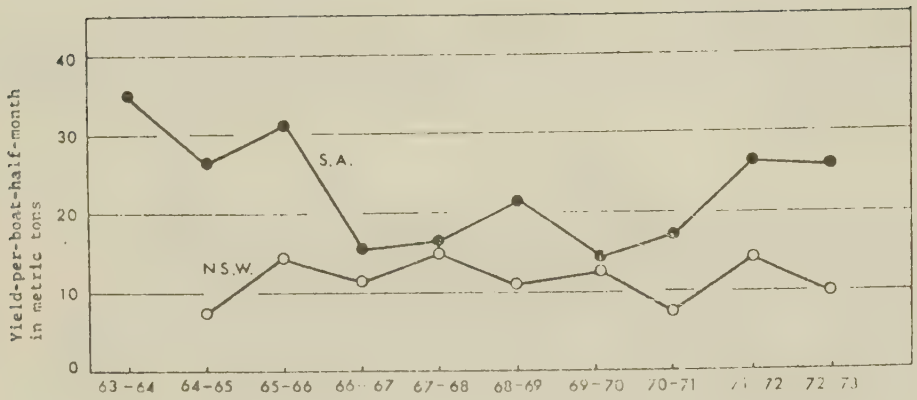

Fig. 7 Yield per boat-half-month of southern bluefin tuna in the Australian surface fishery

open circle: New South Wales
closed circle: South Australia
(from Document 6)

There was considerable discussion on the estimates of the exploitation rate from the Japanese longline fishery. Examination of the average age in the catch and average age at first capture data indicates a Z between 0.3-1.0, whereas earlier Japanese estimates placed F alone at 2.4 (documents 6 and 7). The high F may be due to over-estimating the effective fishing effort and likewise the Z estimates may be too low. The magnitude of the Japanese longline exploitation rate, however, is very important when considering the balance of yield per recruitment between the surface and longline fisheries and for examining the changes in overall yield. The 1968-1974 Australian surface catch has averaged 920 000 fish, weighing 9 000 mt and averaging 3.13 years old. Assuming that M is 0.2 and with the average age in the longline catch at 6.5 to 7 years (47 to 53 kg), then if the surface catch were left in the sea and taken in total by the longline fishery, their weight would increase to about 22 000 mt. The break-even longline exploitation rate is about 40% since the Australian surface catch is presently 9 000 mt; however, the precise value is dependent upon how the average age and average weight change as a function of the exploitation rate in the longline fishery and, of course, it may change if other countries or different gears enter the fishery.

The Working Party offers these recommendations:

1 Perform a cohort analysis of the longline and surface data by the most detailed time strata possible

2 Construct yield per recruit isopleths based on the size-specific F estimates from the cohort analyses under the different hypotheses of stock structure

3 Study effort definition for the Australian surface fishery including but not limited to an analysis of catch/trip and trip length and an analysis of airplane spotting records

4 The governments whose nationals participate in the southern bluefin fishery convene a special working party of scientists of those governments to compile data and conduct analyses of the dynamics of the fishery. Such a meeting should be convened in Shimizu, Japan, or some other suitable location prior to July 1975. It is further proposed that Dr. A. Suda serve as convenor and provisional chairman

4.2.5 Skipjack tuna

4.2.5.1 Indian Ocean

Document 9 was presented as a comprehensive review of the Pacific and Indian Ocean skipjack resources and the corresponding bait resources. The usual belief is that there are large skipjack resources and the catches in these oceans are continuing to increase; however, there are a variety of specialized techniques of fishing with bait peculiar to specific areas. There has been a number of fisheries which have not paid off, and perhaps this is due to a failure to find the right specialized technique for the specific area.

There has been a four to five-fold increase in the catch of skipjack around Sri Lanka (to 10-12 000 mt, 1969-1973) due to the concentration on drift-net fishing. There is no evidence of a decline in the standardized catch per boat in recent years, perhaps there is still even a slight increase after the major increase 1967-1969 (document 12). Concern was expressed that under present conditions in this fishery the catch per boat may not be a good index of abundance.

Concern was expressed over the accuracy of the Maldive catch statistics. Current estimates are 26 000-27 000 mt. Other surface catches of significance are the Indian fisheries, 4 000 mt (1973) and West Pakistan, 5 000 mt.

Examination of one year's data on modal progressions of skipjack around Madagascar indicates a slower rate of growth than for skipjack in other areas of the world (document 11); however, this may be also due at least in part to age specific migration, as apparently occurs in some other parts of the world. There are no really definitive skipjack growth studies anywhere.

There is no new advice on Indian Ocean skipjack over that contained in the First Report.

4.2.5.2 Western Pacific Ocean

Catches have been increasing markedly in the New Guinea area in recent years due to significant joint ventures. Also the southwest expansion of the traditional domestic Japanese baitboat fishery has greatly increased the catches; the improvement in bait holding techniques (up to 35 days) has allowed this development. The fishery in the north is seasonal but the fishery in the southern grounds can operate year-round. There is a big size difference in skipjack between the two areas, around 45 cm in the northern area and 50-65 cm in the southern area, and the extension of the fishing grounds should increase the yield per recruitment overall. Extensive tagging studies have shown that skipjack intermingle among areas in the fishery. The catch for 1973 in the southern area was estimated to be 80 000 mt. Production model analysis of the Home Island fishery (using the logistic form) has indicated an MSY of 250 000 mt, and the present fishery is nearing that value; however, the character of the fishery has been changing over the years and more rapidly in recent years and there is some difference of opinion as to the actual maximum attainable sustained yield.

4.2.5.3 Special considerations

The Working Party recommends that special attention be given to the need for:

1 Instituting mechanisms, early in the development of the skipjack fisheries, for the collection of statistical and biological information

2 Considering the economics and technological problems

3 Looking at skipjack on an oceanwide basis because of the expanding fisheries and the possible interrelationships between stocks

4.2.6 Other small tunas

Not much can be said about the status of those resources. Appendix 4 provides the Working Party's best estimates of the year by year catches. It is noted that there is a Special Committee, chaired by A. Suda, of the FAO Expert Panel for the Facilitation of Tuna Research, looking into this resource. The Working Party urges that the problem of small tunas be addressed as rapidly as possible and would appreciate a report from the Special Committee prior to the next Working Party meeting.

4.3 Theoretical longline-surface interactions

Document 8 was presented and discussed. The relative availability of surface and longline stocks, the changing of sex ratios, and the random dispersal and migration of tunas under inshore and uniform recruitment hypotheses were analyzed with Atlantic yellowfin tuna data as an example. The impact of these phenomena on yield per recruit and yield calculations was demonstrated to be considerable in some cases.

It was recommended that similar analyses be performed for other species of tunas and tuna stocks, particularly southern bluefin tuna, because of the broad differences in parameter values, between species in particular, which may accentuate or de-emphasize the impact on management advice from yield per recruit models.

In order to examine the above problems it may be necessary to collect more, or possibly different, data than is presently being done.

5 IMPLICATIONS FOR MANAGEMENT, DEVELOPMENT, AND FUTURE ACTIVITIES

5.1 Management

Apparently the catches in the Indian Ocean have been dropping in recent years for most of the species, as has the total catch of all species combined, yet the most recent data are not available so as to be able to offer precise up-to-date advice. Particular concern is expressed for albacore and somewhat lesser concern is felt for yellowfin. If there are significant declines in a particular stock, effort may shift accelerating the declines in other stocks resulting in an accelerating "snowball" effect.

The Indian Ocean Fishery Commission (IOFC) should recognize that any increase in longline effort would not result in sustained increases in catch and should urge its member governments to consider this finding in any developmental plans they might have.

Concern is expressed that the totality of management be considered and not just an overall quota system as is often the only consideration. Overall quotas do not address the limitation of effort, capitalization or allocation problems.

It is noted that the concern is expressed mainly for the longline fisheries as there is little information on the surface fisheries, other than southern bluefin tuna. In particular, information is needed on surface-caught yellowfin tuna.

The Working Party felt very strongly that there must be significant advances made in the collection of data and in collaborative analyses before it meets as a whole again. This feeling stems from the fact that no significant improvement in the advice can be made over that offered to the IPFC and IOFC two years ago. Any subsequent general meeting without the corresponding interim work being accomplished would be ineffective, resulting in the mistaken impression that the status of the stocks is under critical review, and in the mistaken appearance that accurate and up-to-date advice is being transmitted to IPFC and IOFC.

The Working Party recommends that each member state be prepared to review actions it has taken concerning this problem at the forthcoming IPFC/IOFC Working Party of Experts on Indian Ocean and Western Pacific Fishery Statistics (Third Session).

The Working Party made a number of critical recommendations in the First Report. These have not been enacted upon to a significant degree, and this lack has severely affected its ability to offer up-to-date reasonable advice. Recognizing these events, the Working Party recommends, as an interim emergency solution, that the Indian Ocean and South China Sea Programmes[1/] be urged to assist in this matter and to take the responsibility to obtain the necessary catch statistical data for assessing the status of the stocks of tunas in the IPFC/IOFC areas of concern.

5.2 Development

It is recommended that the findings and recommendations of the Working Party be transmitted to the South China Sea Programme and to the Indian Ocean Programme.

1/ International Indian Ocean Fishery Survey and Development Programme
South China Sea Fisheries Development and Coordinating Programme

It is recommended that the findings and recommendations of the Working Party be carefully considered by countries of the IPFC/IOFC region while planning their development.

5.3 Future activities

Other specific future activities recommended by the Working Party are located in sections 2, 4.1, 4.2.1.1, 4.2.2, 4.2.3, 4.2.4, 4.2.5, 3, and 4.2.6.

The Working Party calls attention to the fact that the Secretariats of IPFC and IOFC need to be strengthened and that systems for data collection within the convention waters are not complete, and therefore urgently recommends that the Secretariats be strengthened, by the provision of the necessary funds and manpower, to accomplish the necessary data acquisition, including the development of a standard logbook system for all longline vessels, and a list of available data processing facilities.

The Working Party also recommends that action should be taken to consider the scientific study and management of the Pacific tunas on an oceanwide basis and further recommends that better arrangements be made either within or outside the framework of IPFC/IOFC for the exchange of catch statistical and scientific data with China.

Appendix 1

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Appendix 2

AGENDA

1 Adoption of agenda

2 Review of available documents and reports

3 Review of statistical information:

(a) Longline fisheries
(b) Large-scale skipjack fisheries
(c) Other surface fisheries

4 Current trends in fisheries

5 Status of stocks:

(a) Longline fisheries in Indian Ocean and western Pacific

Yellowfin
Albacore
Bigeye
Bluefin

(b) Interaction between surface and longline fisheries

Bluefin
Yellowfin

(c) Skipjack

(d) Other small tunas

6 Implications for management and development

7 Future activities:

Basic data
Other studies

8 Adoption of report

Appendix 3

LIST OF AVAILABLE DOCUMENTS

A Published Papers

1 MARCILLE, J. and Z. SUZUKI. 1974. Distribution of skipjack caught by Japanese tuna longline fishery in the Indian Ocean. Far Seas Fish.Res.Lab.,Bull., 10:87-107

2 SIVASUBRAMANIAM, K. 1971. An aerial survey for surface tuna resources in the seas around Ceylon. Fish.Res.Stn.,Ceylon,Bull., 22:17-21

3 SIVASUBRAMANIAM, K. 1971. Apparent abundance of yellowfin and bigeye tuna in the inshore, offshore and near oceanic ranges around Ceylon. Fish.Res.Stn.,Ceylon,Bull., 22:23-37

4 SIVASUBRAMANIAM, K. 1971. Ceylon's tuna longline fishing effort and catch distribution in the Indian Ocean, 1967-70. Fish.Res.Stn.,Ceylon,Bull., 22:39-45

5 SIVASUBRAMANIAM, K. 1972. Skipjack tuna (K. pelamis, L.) resource in the seas around Ceylon. Fish.Res.Stn.,Sri Lanka,Bull., 23:19-28

6 SUDA, A. 1974. Recent status of resources of tuna exploited by longline fishery in the Indian Ocean. Far Seas Fish.Res.Lab.,Bull., 10:29-64

7 WARASHINA, Y. and K. HISADA. 1974. Preliminary evaluation of effect of the voluntary regulation on stock of southern bluefin tuna and the longline fishery. Far Seas Fish.Res.Lab.,Bull., 10:195-222

B Mimeographed Reports

8 HAYASI, S., C. LUCAS and J.S. HYND. MS. Notes on a workshop on SBF tuna held at Cronulla, 18-22/3/74

9 LENARZ, W. and J. ZWEIFEL. MS. A theoretical examination of some aspects of the interaction between longline and surface fisheries for tunas. 34 p., NMFS, Southwest Fish. Ctr., La Jolla, California

10 LUCAS, C. MS. Working paper on southern bluefin tuna population dynamics. 11 p., CSIRO, Cronulla, Australia

11 MARCILLE, J. and B. STEQUERT. MS. Aperçu sur la pêche et la biologie du skipjack et des jeunes yellowfin et bigeye de la côte nord-ouest de Madagascar. 14 p., ORSTOM, Centre Océanographique de Nossi-Bé, Madagascar

12 SIVASUBRAMANIAM, K. MS. More recent information on the tuna fishery in Sri Lanka, India and the Maldive Islands. 4 p., Fish. Res. Stn., Sri Lanka

13 UCHIDA, R. MS. Recent development in fisheries for skipjack tuna, Katsuwonus pelamis, in the central and western Pacific and Indian Oceans. 67 p., NMFS, Southwest Fish. Ctr., Honolulu, Hawaii

Appendix 4

SUMMARY OF STATISTICS OF LANDINGS (CATCHES) FROM THE INDIAN OCEAN OF TUNA CAUGHT BY VARIOUS GEARS

(After statistics presented by FAO)

Species	Gear	Country	YEAR														
			1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
ALBACORE (T. alalunga)	Longline	China	...	...	...	...	0.2	0.0	1.4	2.9	5.3	7.1	7.6	5.0	(5.0)[2]		
		Japan	12.9	16.8	22.8	15.6	15.3	14.2	12.4	15.3	10.1	11.2	6.3	3.3	0.9		
		Korea (Rep.)[1]	-	-	-	-	-	0.5	0.5		2.9	0.6	3.5	3.2	3.6		
		USSR[2]						0.5	1.0	1.5	0.6	0.9	1.1	0.2	0.2		
		TOTAL:	12.9	16.8	22.8	15.6	15.5	15.2	15.3	19.7	18.9	19.8	18.5	11.7	9.7		
	Surface	Reunion											0.1	0.1			
BIGEYE TUNA (I. obesus)	Longline	China	...	...	...	...	1.8	1.3	0.5	2.6	6.9	6.3	5.3	6.5	(6.5)[2]		
		Japan	9.9	11.1	18.2	15.2	13.4	15.5	17.4	21.9	22.8	16.9	12.5	10.5	8.0		
		Korea (Rep.)[1]	-	-	-	-	-	0.1	0.1	0.2	5.4	3.1	5.9	5.4	5.3		
		Sri Lanka	-	-	-	-	-	-	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	
		USSR[2]				(0.1)	(0.4)	0.5	1.4	2.0	1.3	1.1	1.8	1.0	1.2		
		TOTAL:	9.9	11.1	18.2	15.3	15.6	17.4	19.6	26.8	36.6	27.6	25.6	23.5	21.1		
	Surface	Reunion											0.0	0.0			
YELLOWFIN TUNA (T. albacares)	Longline	China	...	...	...	...	2.8	2.2	1.6	4.3	18.2	16.7	14.8	13.1	(13.1)[2]		
		Japan	33.2	29.8	41.7	26.7	17.3	20.9	27.2	27.3	39.9	22.7	10.9	12.9	6.7		
		Korea (Rep.)[1]	-	-	-	-	-	0.0	0.1	0.2	4.0	6.1	7.9	9.3	10.6		
		Sri Lanka	-	-	-	-	0.2	0.2	0.2	0.3	0.4	0.4	0.3	0.2	0.1	0.1	
		USSR[2]				(0.1)	(0.3)	0.9	2.6	3.1	2.7	1.6	2.0	1.5	1.6		
		TOTAL:	33.2	29.8	41.7	26.8	20.6	24.2	33.7	35.2	65.2	47.5	35.9	37.0	32.1		
	Surface	Australia												0.1	0.1		
		Bangladesh[3]						0.1	0.2	0.1	0.1	0.1					
		India						0.8[3]	1.0[3]	1.0[3]	1.3[3]	1.1[3]	0.5[3]	0.2	0.2	0.2	0.2
		Madagascar													0.2	0.5	1.7
		Maldives						0.5	1.5	1.7	1.7	1.8	1.2	1.3	0.5		
		Pakistan						0.5	0.7	0.8	0.7	0.6	0.3	0.2	0.3	0.2	
		Reunion												0.0	0.0	0.0	
		Sri Lanka[4]					2.0	1.7	2.0	2.6	4.1	3.8	4.0	3.8	5.1	5.0	
		TOTAL:					2.0	3.6	5.4	6.2	7.9	7.4	6.0	5.6	6.9		
		GRAND TOTAL (Longline + Surface):					22.6	27.8	39.1	41.4	73.1	54.9	41.9	42.6	39.0		
SOUTHERN BLUEFIN (T. maccoyii)	Longline	China								0.0	0.2	0.2	0.2	0.0			
		Japan (Ind.)	46.5	42.2	23.6	23.2	22.0	21.7	13.4	27.8	26.8	28.1	19.5	22.6	19.6		
		(Pac.)[5]	6.0	15.0	9.3	25.6	23.6	15.1	19.0	17.8	17.9	18.0	19.2	17.4	18.0		
		Korea (Rep.)[2]									0.1	0.8	1.2	0.2	0.2		
		TOTAL:	52.5	57.2	32.9	48.8	45.6	36.8	32.4	45.6	45.0	47.1	40.1	40.2	37.8		
	Surface	Australia						7.2	8.1	7.2	8.5	8.8	5.4	7.8	10.4	8.6	6.9
		GRAND TOTAL:						44.0	40.5	52.8	53.5	55.9	45.5	48.0	48.2		

Species	Gear	Country	YEAR													
			1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
SKIPJACK (K. pelamis)	Longline	Japan						0.1	0.1	0.2	0.3	0.3	0.1	0.1	0.2		
		Korea (Rep.)											0.1	0.1	0.1		
		TOTAL:						0.1	0.1	0.2	0.3	0.3	0.2	0.2	0.3		
	Surface	Australia						0.1[5/]	0.1[5/]	0.1[5/]	0.1[5/]	0.1[5/]	0.1[5/]	0.0	0.1		
		Bangladesh[3/]						1.7	1.7	0.6	0.7	1.5	0.7	0.7	0.9		
		India						10.6[3/]	10.2[3/]	11.6[3/]	13.6[3/]	11.6[3/]	7.9[3/]	5.1	4.8	4.8	
		Israel[5/]						0.6	0.2	0.1							
		Madagascar													3.3	4.5	8.0[7/]
		Maldives						13.1[6/]	15.9[6/]	17.9[6/]	16.3[6/]	18.4	26.1	27.4	15.0[6/]		
		Pakistan						6.2	7.8	7.9	6.6	6.0	5.4	6.0	8.1	5.8	
		Reunion						0.1[3/]	0.1[3/]	0.2[3/]	0.3[3/]	0.3[3/]	0.0	0.0	0.0	0.0	
		Sri Lanka						2.5	3.0	3.7	6.0	10.0	11.0	9.8	12.4	10.5	
		Indonesia						(7)	(10)	(10)	(10)	(10)	(10)	(13)	(15)		
		TOTAL:						41.9	49.0	52.1	53.6	57.9	61.2	62.8	69.6	(25.6)	
		GRAND TOTAL:						42.0	49.1	52.3	53.9	58.2	61.4	63.0	63.9		
LITTLE TUNA (E. affinis)	Surface	Bangladesh[3/]										0.1					
		India								0.3[3/]	0.5[3/]	0.4[3/]	0.2[3/]	0.3	0.3	0.3	
		Maldives						0.0	0.0	0.5[6/]	0.5[6/]	0.6	0.2	0.2	0.2		
		Pakistan								0.2	0.2	0.2	0.1	0.1	0.1	0.1	
		Sri Lanka						3.0	3.0	3.5	4.0	4.0	4.0	2.4	2.3	2.0	
		Yemen (Pep.Rep.)					2.9	2.0	1.2	1.0	1.3	1.3	1.3	1.3			
		TOTAL:					(2.9)	5.0	4.2	5.5	6.5	5.6	5.8	4.3	(2.9)	(2.4)	
FRIGATE MACKEREL (A. thazard)	Surface	Bangladesh[3/]						0.4	0.3	0.1	0.1	0.2	0.7	0.7	0.5		
		India						2.0[3/]	2.0[3/]	1.7[3/]	2.3[3/]	1.9[3/]	7.9[3/]	0.2	0.2	0.2	
		Maldives						2.5[6/]	3.0[6/]	3.0[6/]	3.0[6/]	3.0	1.7	1.8	9.0[6/]		
		Pakistan						1.2	1.5	1.3	1.3	1.0	5.5	5.6	4.9	5.5	
		Reunion[3/]											0.0	0.2	0.2		
		Sri Lanka						4.5	4.5	5.0	5.0	5.5	5.0	3.2	4.1	3.8	
		Tanzania[3/]												0.4	0.6		
		TOTAL:						10.9	11.3	11.1	11.7	11.6	20.8	12.1	19.5		
		GRAND TOTAL ALL SPECIES:						165.3	179.1	209.6	254.2	233.6	219.6	205.3	204.3		

1/ Official statistics are given for albacore and yellowfin combined
Species breakdown for 1960-1969 is based on personal communication
Species breakdown for 1970 is based on Japanese species composition for Area 61

2/ For 1960-1964: equally split between albacore, bigeye, and yellowfin
For 1965 : species breakdown based on Japanese species composition for Area 61
southern bluefin catch is excluded

3/ Unspecified species catch was distributed based upon Maldive Area 51 species composition

4/ Catches in the Atlantic and Pacific probably from the same population

5/ Unspecified tunas assigned to oceanic skipjack

6/ Estimate in FAO Yearbook

7/ Estimate for half year period

8/ From Document 12

9/ Estimate based on previous year's catch

() Rough estimate or total of partial data

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